WHAT IS CLAIMED IS:

1. A wire bonding machine, comprising:

a bond head adapted to manipulate a wire, the bond head comprising a wire braking apparatus and a fixed portion;

the wire braking apparatus comprising:

a first bearing member comprising a first race adapted to rotate about a first rotational axis of the first bearing member, wherein the first race has a first outer end with a first generally concave-shaped portion, wherein the first race has a first side and a second side, wherein the first and second sides of the first race face opposite directions along the first rotational axis;

a second bearing member comprising a second race adapted to rotate about a second rotational axis of the second bearing member, wherein the second race has a second outer edge with a second generally concave-shaped portion, wherein the first outer end of the first race faces the second outer end of the second race; and

a first piezoelectric element located between the first bearing and the fixed portion of the bond head,

the first piezoelectric element being configured so that a first tolerance gap exists between the first piezoelectric element and at least one of the first race and the fixed portion when the first piezoelectric element is not energized, and

the first piezoelectric element being configured so that the first piezoelectric element may be energized to expand between the fixed portion and the first bearing thereby substantially eliminating the first tolerance gap, and to press against the first side of the

first race thereby hindering rotational movement of the first race relative to the fixed portion of the bond head.

2. The wire bonding machine of claim 1, wherein the bond head further comprises:

a support member;

a first shaft extending from the support member, wherein the first rotational axis extends along the first shaft, and wherein the first bearing member is located on the first shaft;

a second shaft extending from the support member, wherein the second rotational axis extends along the second shaft, and wherein the second bearing member is located on the second shaft.

3. The wire bonding machine of claim 2, wherein the fixed portion is part of the support member, and wherein the first piezoelectric element is located on the first shaft between the first bearing member and the support member.

4. The wire bonding machine of claim 3, wherein the first shaft has a first shaft head on a distal end thereof, and wherein the bond head further comprises:

a second piezoelectric element located on the first shaft between the first bearing and the first shaft head of the first shaft,

the second piezoelectric element being configured so that a second tolerance gap exists between the second piezoelectric element and at least one of the first race and the first shaft head when the second piezoelectric element is not energized, and

the second piezoelectric element being configured so that the second piezoelectric element may be energized to expand between the first shaft head and the first bearing thereby

substantially eliminating the second tolerance gap, and to press against the second side of the first race thereby hindering rotational movement of the first race relative to the first shaft head.

5. The wire bonding machine of claim 4, wherein the bond head further comprises a third shaft extending from the support member, wherein the third shaft extends through the first and second piezoelectric elements.

6. The wire bonding machine of claim 4, wherein the bond head further comprises a stop portion extending from the support member, the stop portion being positioned relative to the first and second piezoelectric elements such that the stop portion limits a rotational range of motion of the first and second piezoelectric elements about the first rotational axis of the first shaft.

7. The wire bonding machine of claim 4, wherein the second race has a first side and a second side, wherein the first and second sides of the second race face opposite directions along the second rotational axis, wherein the second shaft has a second shaft head on a distal end thereof, and wherein the bond head further comprises:

a third piezoelectric element located on the second shaft between the second bearing and the support member of the bond head,

the third piezoelectric element being configured so that a third tolerance gap exists between the third piezoelectric element and at least one of the second race and the support member when the third piezoelectric element is not energized, and

the third piezoelectric element being configured so that the third piezoelectric element may be energized to expand between the support member and the second bearing thereby substantially eliminating the third tolerance gap, and to press against the first side of the second race thereby hindering rotational movement of the second race relative to the support member;

a fourth piezoelectric element located between the second bearing and the second shaft head of the second shaft,

the fourth piezoelectric element being configured so that a fourth tolerance gap exists between the fourth piezoelectric element and at least one of the second race and the second shaft head when the fourth piezoelectric element is not energized, and

the fourth piezoelectric element being configured so that the fourth piezoelectric element may be energized to expand between the second shaft head and the second bearing thereby substantially eliminating the fourth tolerance gap, and to press against the second side of

the second race thereby hindering rotational movement of the second race relative to the second shaft head.

8. The wire bonding machine of claim 1, wherein the fixed portion is part of a support member of the bond head, wherein the support member has a first interior side and a second interior side separated by a support member gap, and wherein the bond head further comprises:

a first shaft extending from the first interior side to the second interior side of the support member within the support member gap, wherein the first rotational axis extends along the first shaft, and wherein the first bearing member is located on the first shaft;

a second shaft extending from the first interior side to the second interior side of the support member within the support member gap, wherein the second rotational axis extends along the second shaft, and wherein the second bearing member is located on the second shaft;

a second piezoelectric element located between the first bearing and the second interior side of the support member,

the second piezoelectric element being configured so that a second tolerance gap exists between the second piezoelectric element and at least one of the first race and the second interior side of the support member when the second piezoelectric element is not energized, and

the second piezoelectric element being configured so that the second piezoelectric element may be energized to expand between the second interior side of the support member and the first bearing thereby substantially eliminating the second tolerance gap, and to press against the second side of the first race thereby hindering rotational movement of the first race relative to the support member.

9. The wire bonding machine of claim 1, wherein the fixed portion is part of a support member of the bond head, wherein the support member has a first interior side and a second interior side separated by a support member gap, wherein the second race has a first side and a second side, wherein the first and second sides of the second race face opposite directions along the second rotational axis, and wherein the bond head further comprises:

a first shaft extending from the first interior side to the second interior side of the support member within the support member gap, wherein the first rotational axis extends along the first shaft, and wherein the first bearing member is located on the first shaft;

a second shaft extending from the first interior side to the second interior side of the support member within the support member gap, wherein the second rotational axis extends along the second shaft, and wherein the second bearing member is located on the second shaft;

a second piezoelectric element located between the first bearing and the second interior side of the support member,

the second piezoelectric element being configured so that a second tolerance gap exists between the second piezoelectric element and at least one of the first race and the second interior side of the support member when the second piezoelectric element is not energized, and

the second piezoelectric element being configured so that the second piezoelectric element may be energized to expand between the second interior side of the support member and the first bearing thereby substantially eliminating the second tolerance gap, and to press against the second side of the first race thereby hindering rotational movement of the first race relative to the support member;

a third piezoelectric element located on the second shaft between the second bearing and the first interior side of the support member,

the third piezoelectric element being configured so that a third tolerance gap exists between the third piezoelectric element and at least one of the second race and first interior side of the support member when the third piezoelectric element is not energized, and

the third piezoelectric element being configured so that the third piezoelectric element may be energized to expand between first interior side of the support member and the second bearing thereby substantially eliminating the third tolerance gap, and to press against the first side of the second race thereby hindering rotational movement of the second race relative to the support member;

a fourth piezoelectric element located between the second bearing and the second interior side of the support member,

the fourth piezoelectric element being configured so that a fourth tolerance gap exists between the fourth piezoelectric element and at least one of the second race and the second interior side of the support member when the fourth piezoelectric element is not energized, and

the fourth piezoelectric element being configured so that the fourth piezoelectric element may be energized to expand between the second interior side of the support member and the second bearing thereby substantially eliminating the fourth tolerance gap, and to press against the second side of the second race thereby hindering rotational movement of the second race relative to the support member.

10. The wire bonding machine of claim 3, wherein the bond head further comprises a stop portion extending from the support member, the stop portion being positioned relative to the first piezoelectric element such that the stop portion limits a rotational range of motion of the first piezoelectric element about the first rotational axis of the first shaft.

11. The wire bonding machine of claim 2, wherein the bond head further comprises:

third and fourth shafts extending from the support member, wherein the first piezoelectric element is supported by the third and fourth shafts.

12. The wire bonding machine of claim 1, wherein the fixed portion is part of a support member of the bond head, wherein the support member has a first interior side and a second interior side separated by a support member gap, and wherein the bond head further comprises:

a first shaft extending from the first interior side to the second interior side of the support member within the support member gap, wherein the first rotational axis extends along the first shaft, and wherein the first bearing member is located on the first shaft;

a second shaft extending from the first interior side to the second interior side of the support member within the support member gap, wherein the second rotational axis extends along the second shaft, and wherein the second bearing member is located on the second shaft;

a first piezo support member extending from the first interior side to the second interior side of the support member within the support member gap;

a second piezoelectric element located between the first bearing and the second interior side of the support member,

the second piezoelectric element being configured so that a second tolerance gap exists between the second piezoelectric element and at least one of the first race and the second interior side of the support member when the second piezoelectric element is not energized, and

the second piezoelectric element being configured so that the second piezoelectric element may be energized to expand between the second interior side of the support member and the first bearing thereby substantially eliminating the second tolerance gap, and to press against the second side of the first race thereby hindering rotational movement of the first race relative to

the support member,

wherein the first piezo support member at least partially supports the first and second piezoelectric elements.

13. The wire bonding machine of claim 12, wherein the bond head further comprises:

a second piezo support member extending from the first interior side to the second interior side of the support member within the support member gap, wherein the second piezo support member at least partially supports the first and second piezoelectric elements.

14. The wire bonding machine of claim 1, wherein the first generally concave-shaped portion of the first race has a radius smaller than a radius of a wire for which the bond head is adapted to manipulate.

15. The wire bonding machine of claim 1, wherein the first generally concave-shaped portion of the first race has a radius equal to or greater than a radius of a wire for which the bond head is adapted to manipulate.

16. The wire bonding machine of claim 1, wherein the bond head further comprises a spring member configured to bias the second race toward the first race.

17. The wire bonding machine of claim 1, wherein the bond head further comprises a spring member configured to bias the first race toward the second race.

18. A wire bonding machine, comprising:

a bond head adapted to manipulate a wire, the bond head comprising a wire braking apparatus and a support member;

the wire braking apparatus comprising:

a first bearing member comprising a first race adapted to rotate about a first rotational axis of the first bearing member;

a second bearing member comprising a second race adapted to rotate about a second rotational axis of the second bearing member, wherein the first race is opposite the second race in a configuration for accepting a wire fed between and in contact with the first and second race; and

a first piezoelectric element located proximate to the first race of the first bearing so that a first tolerance gap exists between the first piezoelectric element and the first race when the first piezoelectric element is not energized, and so that the first piezoelectric element may be energized to expand to thereby substantially eliminate the first tolerance gap and to press against the first race thereby hindering rotational movement of the first race relative to the support member of the bond head.

19. The wire bonding machine of claim 18, wherein the first race has a first outer end with a first generally concave-shaped portion, and wherein the second race has a second outer edge with a second generally concave-shaped portion, wherein the first outer end of the first race faces the second outer end of the second race.

20. The wire bonding machine of claim 18, wherein the first race has a first side and a second side, wherein the first and second sides of the first race face opposite directions along the first

rotational axis, wherein the first piezoelectric element is positioned and configured so that the first piezoelectric element may be energized to expand between the support member and the first bearing thereby substantially eliminating the first tolerance gap, and to press against the first side of the first race thereby hindering rotational movement of the first race relative to the support member.

21. A method of fabricating a packaged semiconductor chip, comprising:

bonding a wire on a chip contact pad of a semiconductor chip using a wire bonding machine;

moving a bond head of the wire bonding machine relative to the chip contact pad, thereby pulling a first length of the wire out of the wire bonding machine, wherein part of the wire passes through a space between a first outer edge of a first bearing race and a second outer edge of a second bearing race during the pulling of the first length;

bonding the wire on a lead using the wire bonding machine;

energizing a first piezoelectric element in the bond head, thereby causing the first piezoelectric element to expand and press against the first bearing race;

braking the first bearing race by the pressing of the first piezoelectric element against the first bearing race;

braking the wire between the first and second races at least partially by the braking of the first bearing race;

moving the bond head relative to the lead during the braking of the wire;

severing the wire proximate to the lead.

22. The method of claim 21, further comprising:

de-energizing the first piezoelectric element, thereby causing the first piezoelectric element to reduce in size, thereby ending the pressing of the first piezoelectric element against the first bearing race, and thereby causing a first tolerance gap to form between the first piezoelectric element and the first bearing race, such that the first bearing race may rotate with movement of the wire.

23. The method of claim 21, wherein the first bearing race rotates when the wire part passes through the space between the first outer edge of the first bearing race and the second outer edge of the second bearing race during the pulling of the first length of the wire.

24. A wire bonding machine, comprising:

a bond head adapted to manipulate a wire, the bond head comprising a wire braking apparatus and a support member;

the wire braking apparatus comprising:

a first bearing member comprising a first race adapted to rotate about a first rotational axis of the first bearing member;

a second bearing member comprising a second race adapted to rotate about a second rotational axis of the second bearing member, wherein the first race is opposite the second race in a configuration for accepting a wire fed between and in contact with the first and second race; and

a bearing braking actuator located proximate to the first race of the first bearing so that the bearing braking actuator may be actuated to brake the first race thereby hindering rotational movement of the first race relative to the support member of the bond head.

25. The wire bonding machine of claim 24, wherein the first race has a first outer end with a first generally concave-shaped portion, and wherein the second race has a second outer edge with a second generally concave-shaped portion, wherein the first outer end of the first race faces the second outer end of the second race.